MKS Elementary Science Continuum

Physical Sciences

	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
Unit	**Waves - Light and Sound**	**Structures and Properties of Matter**	**Forces and Interactions**	**Energy**	**Structure and Properties of Matter**
Big Idea	Students investigate the relationship between sound and vibration to construct an understanding that some things that vibrate make sound and that sound can make some things vibrate. This presents a great opportunity to bring musical instruments into the classroom and experiment with them. Students play with light and shadow - and come to understand that light is necessary for us to see. Experimenting with different materials helps students understand how they (the materials) interact differently with light.	Students will be thinking about different materials they interact with and what properties those materials have. Why are tires made of rubber? What if the blanket on your bed was made of metal? What would be a silly thing to make a pencil out of? This unit presents a great opportunity to help students begin to expand the way they think about engineers. In grade 2, students likely only think of engineers as men and women that make roads, rockets, buildings and bridges, but of course they do a lot more. For example, engineers make glue, fabric, machines and gel pens - and there is even a whole group of engineers who make food and toothpaste (and candy).	This unit deals with forces, both balanced and unbalanced. Students explore forces and motion and how patterns can be used to make predictions. Factors that affect magnetic and electric forces are investigated. There is an engineering and design component to this unit in which students apply their understanding of magnetic interactions to define a simple design problem that can be solved with magnets.	This unit is a larger unit with five Performance Expectations. Students continue to build on their understanding of energy and its relationship to motion. They explore the many ways energy might be moved from one place to another and consider the relationship between humans, energy and natural resources.	There are a few very big ideas in this unit that students work towards understanding and that are central to understanding the physical sciences and other sciences as students move forward. The first is the idea that all things are made of smaller particles. Students need to model air as a collection of particles and recognize that these are in motion and have mass/weight (there is no expectation that students distinguish between these). The second big idea is the conservation of matter, and therefore mass/weight. Even when things seem to change or get smaller or bigger, such as in some chemical reactions, the number of particles always remains the same. In a closed system, therefore, the weight will remain the same as well. How do we create learning experiences that will allow students to construct their own understanding of these concepts? This unit makes sense to engage students before the life science unit, as students in life science will be following matter through systems.
Essential Questions	● Why is it harder to see things when it's dark? ● What causes different sounds? ● How do different materials interact with light?	● Why are things made of what they are made of? ● How can we describe and group different kinds of matter?	● What is a force? ● What affects the force of a magnet? ● How can we use magnets to solve problems?	● What is energy? ● How are energy and motion related to one another? ● How can energy be moved from one place to another?	● What is air made of? ● How does wind move things? ● How can we figure out what something is made of when we don't know? ● What is a chemical reaction?
Standards	1-PS4-1: Sound can make matter vibrate, and vibrating matter can make sound. 1-PS4-2: Objects can be seen if light is available to illuminate them or if they give off their own light. 1-PS4-4: People also use a variety of devices to communicate (send and receive information) over long distances.	**2-PS1-1:** Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties. (2-PS1-1) **2-PS1-2/2-PS1-3:** Different properties are suited to different purposes. **2-PS1-3:** A great variety of objects can be built up from a small set of pieces.	**3-PS2-1:** Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (Boundary: Qualitative and conceptual, but not quantitative addition of forces is used at this level.) (3-PS2-1) **3-PS2-2**: The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.) **3-PS2-1:** Objects in contact exert forces on each other.	**4-PS3-1:** The faster a given object is moving, the more energy it possesses. **4-PS3-2/4-PS3-3:** Energy can be moved from place to place by moving objects or through sound, light, or electric currents. **4-PS3-2/4-PS3-3:** Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. **4-PS3-2:** Light also transfers energy from place to place. **4-PS3-3:** When objects collide, the contact forces transfer energy so as to change the objects' motions.	**5-PS1-1:** Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects. **5-PS1-2:** The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. **5-PS1-4:** When two or more different substances are mixed, a new substance with different properties may be formed. **5-PS1-2:** No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.)

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			3-PS2-3/3-PS2-4: Electric, and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other.		
Science and Engineering Practices	**Planning and Carrying Out Investigations:** **1-PS4-1:** Plan and conduct investigations collaboratively to produce evidence to answer a question. **Constructing Explanations and Designing Solutions:** **1-PS4-2:** Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. **1-PS4-4:** Use tools and materials provided to design a device that solves a specific problem.	**Planning and Carrying Out Investigations:** **2-PS1-1:** Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. **Analyzing and Interpreting Data:** **2-PS1-2** Analyze data from tests of an object or tool to determine if it works as intended. **Constructing Explanations and Designing Solutions:** **2-PS1-3:** Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.	**Asking Questions and Defining Problems:** **3-PS2-4:** Define a simple problem that can be solved through the development of a new or improved object or tool. **3-PS2-3:** Ask questions that can be investigated based on patterns such as cause and effect relationships. **Planning and Carrying Out Investigations:** **3-PS2-1:** Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. **3-PS2-2:** Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.	**Asking Questions and Defining Problems:** **4-PS3-3:** Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. **Planning and Carrying Out Investigations:** **4-PS3-2:** Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. **Constructing Explanations and Designing Solutions:** **4-PS3-1:** Use evidence (e.g., measurements, observations, patterns) to construct an explanation.	**Developing and Using Models**: **5-PS1-1:** Develop a model to describe phenomena. **Planning and Carrying Out Investigations:** **5-PS1-4:** Conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. **Using Mathematics and Computational Thinking:** **5-PS1-2:** Measure and graph quantities such as weight to address scientific and engineering questions and problems.
Unit				**Waves and Information**	
Big Idea				Students engage with waves and learn about the concepts of wavelength and amplitude. They will also consider, likely for the first time, how information travels over long distances and think about some of the technology they use and are familiar with.	
Essential Questions				● What are waves? ● How does information travel?	
Standards				**4-PS4-1:** Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach. **4-PS4-1:** Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). **4-PS4-3:** Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa.	

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				4-PS-3: Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.	
Science and Engineering Practices				**Developing and Using Models** **4-PS4-1:** Develop a model using an analogy, example, or abstract representation to describe a scientific principle. **Constructing Explanations and Designing Solutions:** **4-PS4-3:** Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.	

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Life Sciences

	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
Unit	**Structure, Function and Information**	**Interdependent Relationships in Ecosystems**	**Interdependent Relationships in Organisms**	**Structure, Function and Information Processing**	**Matter & Energy in Organisms and Ecosystems**
Big Idea	Having noticings, wonderings and conversations around lots and lots of examples of different plant and animal adaptations, sensory organs, parent and child similarities etc. will help students understand the key content in this unit. While camouflage is one great example of an adaptation, try to find many distinct adaptations.	This unit finds student scientists wondering about why certain things live where they do. They focus on plants and engage in group experimentation to determine what, exactly, plants need to grow - and find that some plants can grow without soil.	This unit touches on several different ideas about organisms and their environment. Students are building towards an understanding of natural selection and evolution, the benefits of group behavior and life cycles. They consider the relationships between organisms and their environments and think about many ways that being part of a group can aid in survival.	During this unit students engage in modeling how organisms get, process and respond to information. While they consider many such examples, they model and focus on how animals (including us) see and understand the world around them. Students will expand some of this thinking to include plant and animal adaptations. Students are asked to think about phenomena by considering cause and effect relationships and the systems they are investigating (in this case living things).	During this unit students investigate and work on understanding the flow of energy and matter through food webs (the living world) and between the living and non-living worlds (carbon dioxide, oxygen, water, light etc.). In grade 5 students will strive for deep understanding by making sense of the role of both plants and decomposers in these flows. While plants are the link between the energy of the sun and life on Earth, decomposers are one of the main engines that move materials from the biotic world (dead animals and plants) to the non-living, abiotic world by breaking them down and releasing their atoms into the air as carbon dioxide
Essential Questions	• What parts do plants and animals have to help them live? • What do animals do to help their babies live and grow? • What actions do plants and animals take to help them live and grow? • Do all of the same kind of plants and the same kind of animals look alike?	• What different plants and animals live on land? In the water? • What do plants need to live and grow?	• What happens to living things when their environment changes? • What can we learn from fossils?	• Why can't we see in the dark? • How do animals (including humans) make sense of the world around them?	• Where do plants get the materials they need to grow? • Where does the energy in food come from? How does it get there? • What happens to the food I eat? • What happens to all of the dead things? Where do they go?
Standards	• 1-LS1-1: All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. • 1-LS1-2: Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive. • 1-LS1-1: Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs.	• 2-LS2-1: Plants depend on water and light to grow. • 2-LS4-1: There are many different kinds of living things in any area, and they exist in different places on land and in water. • 2-LS2-2: Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.	• 3-LS4-1: Some kinds of plants and animals that once lived on Earth are no longer found anywhere. • 3-LS4-1: Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. • 3-LS4-3: For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. • 3-LS4-4: Populations live in a variety of habitats, and change in those habitats affects the organisms living there.	• 4-PS4-2: An object can be seen when light reflected from its surface enters the eyes. • 4-LS1-1: Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. • 4-LS1-2: Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions.	5-PS3-1: The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). 5-LS1-1: Plants acquire their material for growth chiefly from air and water. 5:LS-1: The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. 5-LS2-1: Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment.
Science and Engineering Practices	**Constructing Explanations and Designing Solutions:**	**Planning and Carrying Out Investigations:** **2-LS2-1:** Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.	**Analyzing and Interpreting Data:** **3-LS4-1:** Analyze and interpret data to make sense of phenomena using logical reasoning. **Engaging in Argument from Evidence:**	**Developing and Using Models:** **4-PS4-2:** Develop a model to describe phenomena.	**Developing and Using Models:** **5-LS2-1:** Develop a model to describe phenomena. **5-PS3-1: Use models to describe phenomena**.

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	1-LS1-1: Use materials to design a device that solves a specific problem or a solution to a specific problem. **Obtaining, Evaluating, and Communicating Information:** **1-LS1-2:** Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world.	**2-LS4-1: Make observations** (firsthand or from media) to collect data which can be used to make comparisons.	**3-LS4-3:** Construct an argument with evidence. **3-LS4-4:** Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.	**4-LS1-2:** Use a model to test interactions concerning the functioning of a natural system. **Engage in Argument from Evidence:** **4-LS1-1:** Construct an argument with evidence, data, and/or a model.	**Engaging in Argument from Evidence:** **5-PS3-1:** Energy can be transferred in various ways and between objects. **5-LS1-1:** Matter is transported into, out of, and within systems.
Unit 2					
Unit			**Inheritance and Variation of Traits**		
Big Idea			**Big Ideas:** In this unit students explore varied life cycles and consider the influences of inheritance and environment on living things - in this case plants and animals. They begin to recognize that some differences between members of the same species can give advantages in survival and reproduction. Students are building towards an understanding of natural selection and evolution.		
Essential Questions			● **3-LS1-1:** How do different kinds of plants and animals reproduce? ● **3-LS3-1, 3-LS2-3:** What makes living things look and act the way they do? ● **3-LS4-2:** Do differences in members of the same species (i.e. in the number of spots each ladybug has) matter?		
Standards			● **3-LS1-1:** Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. ● **3-LS3-1**: Many characteristics of organisms are inherited from their parents. ● **3-LS3-2:** Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. ● **3-LS3-1:** Different organisms vary in how they look and function because they have different inherited information. ● **3-LS3-2:** The environment also affects the traits that an organism develops. ● **3-LS4-2:** Natural Selection: Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing.		
Science and Engineering Practices			**Analyzing and Interpreting Data:** Analyze and interpret data to make sense of phenomena using logical reasoning. **Constructing Explanations and Designing Solutions:** **3-LS4-2:** Use evidence (e.g., observations, patterns) to construct an explanation. **3-LS3-2:** Use evidence (e.g., observations, patterns) to support an explanation. **Developing and Using Models:** **3-LS4-2:**Develop a model to describe phenomena.		

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Earth and Space Science					
	Grade 1	**Grade 2**	**Grade 3**	**Grade 4**	**Grade 5**
Unit	**Space Systems: Patterns and Cycles**	**Earth's Systems: Processes that Shape the Earth**	**Weather and Climate**	**Earth's Systems: Processes that Shape the Earth**	**Earth's Systems** **Critical Areas**
Big Idea	Students will identify patterns in the sky around the sun, moon and stars and realize that they can make predictions based on these patterns. Emphasis should be on looking at and talking about data and the connection between patterns and making predictions.	Students think about the different ways landforms change and some of the forces that cause these changes. Water is a main focus as students learn about where water is on our planet and how it contributes to erosion. Students should be considering some of the ways in which humans are trying to prevent or slow some of the land-changing events that can cause problems for humans.	Students learn the important distinction between weather and climate and that weather patterns can be used to make important predictions that may help reduce impacts of some natural disasters. Students should look at, discuss and interpret lots of data about weather and climate in as many forms as possible (maps, pie charts, bar graphs etc.) They should identify patterns in data and discuss and debate the best ways to display raw data.	Students consider how land is shaped and formed and consider rock layers, fossils and erosion. They also consider how life on our planet impacts the shape of the land. Students realize that mountain, volcano and earthquake locations reveal patterns linked to tectonic plate boundaries. They also consider how humans might lessen the effects of some natural hazards.	Students think about and investigate Earth's systems, how they are connected and Earth's natural resources. There is a special focus on water - including where it is and how much of it is really available for human use (salt vs fresh). This unit lends itself well to engineering design as students investigate the challenges that humans face regarding limited clean water around the globe.
Essential Questions	• Can we predict where the sun will be later in the day? The moon? • Will the length of the day be longer or shorter tomorrow? Next month? • Are the sun and the moon ever in the sky at the same time?	• Has the land always looked like it does now? • What causes landforms to change? • How does water affect the shape of the land? • Where is the water on our planet?	• What is the difference between weather and climate? (3-ESS2-2) • Why do we spend so much time and money trying to predict the weather? (3-ESS2-1) • How can we protect ourselves from natural hazards? (3-ESS3-1)	• Why does the Earth's surface look so different in different places? • Why do volcanoes, earthquakes and mountains seem to mostly occur in the same places? • How do animals and plants affect the land they live on?	• Where does the water I use come from and where does it go? • How much water is on the planet and where is it? • How do all of the different systems on Earth - the atmosphere, the ocean systems, the biosphere, etc. - work together to make the planet work and to sustain life?
Standards	• **1-ESS1-1:** Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. • **1-ESS1-2:** Seasonal patterns of sunrise and sunset can be observed, described, and predicted.	• **2-ESS1-1:** Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. • **2-ESS2-1:** Wind and water can change the shape of the land. • **2-ESS2-2:** Maps show where things are located. One can map the shapes and kinds of land and water in any area. • **2-ESS2-3:** Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form. • **2-ESS2-1:** Because there is always more than one possible solution to a problem, it is useful to compare and test designs.	• **3-ESS2-1:** Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. • **3-ESS2-2:** Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. • **3-ESS3-1:** A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts.	• **4-ESS1-1:** Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. • **4-ESS2-1:** Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. • **4-ESS2-2:** The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth.	• **5-ESS2-1:** Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. • Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere.
Science and Engineering Practices	**Planning and Carrying Out Investigations:** **1-ESS1-2:** Make observations (firsthand or from media) to collect data that can be used to make comparisons. **Analyzing and Interpreting Data:** **1-ESS1-1:** Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions.	**Developing and Using Models:** **2-ESS2-1:** Develop a model to represent patterns in the natural world. **Obtaining, Evaluating, and Communicating Information:** **2-ESS2-3:**Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons),	**Analyzing and Interpreting Data:** **3-ESS2-1:** Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships. **Engaging in Argument from Evidence:** **3-ESS3-1:** Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.	**Analyzing and Interpreting Data:** **4-ESS2-2:** Analyze and interpret data to make sense of phenomena using logical reasoning. **Constructing Explanations and Designing Solutions:** **4-ESS1-1:** Identify the evidence that supports particular points in an explanation.	**Developing and Using Models:** **5-ESS2-1:** Develop a model using an example to describe a scientific principle. **Using Mathematics and Computational Thinking:** **5-ESS2-2:** Describe and graph quantities such as area and volume to address scientific questions.

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		and other media that will be useful in answering a scientific question. **Constructing Explanations and Designing Solutions:** **2-ESS1-1:** Make observations from several sources to construct an evidence-based account for natural phenomena. **2-ESS2-1:** Compare multiple solutions to a problem.	**Obtaining, Evaluating, and Communicating Information:** **3-ESS2-2:** Obtain and combine information from books and other reliable media to explain phenomena.		
Unit					**Stars and the Solar System**
Big Idea					Students investigate and work to understand the many patterns that result from the Earth moon system and its motion. They also start thinking more deeply about gravity on Earth. This unit can be a lot of fun, but can also move far beyond the targeted content.
Essential Questions					● What causes the seasons? ● What causes tides? Why are there two high tides every day? ● Why do we only ever see one side of the moon? ● Can we predict the locations of different stars? ● What is gravity?
Standards					**5-PS-1:** The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. **5-ESS1-2:** The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year.
Science and Engineering Practices					**Analyzing and Interpreting Data:** **5-ESS1-2:** Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. **Engaging in Argument from Evidence:** **5-PS2-1:** Support an argument with evidence, data, or a model.